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Thirty-eight secondary school teachers from seven public school systems attending a five week full-time institute at Montgomery Junior College participated in this summer program. The teachers were introduced to the newly available Earth Science Curriculum Project materials. Three college teachers and an experienced ESCP high school teacher conducted most of the 160 hours of lectures, laboratories, and field trips. Three-fourths of this time was devoted to laboratory work with ESCP materials and related college-level content. Twelve guest lecturers representing universities, government, and industry spoke on topics related to ESCP subject matter. Six Saturday follow-up meetings were held throughout the 1967-68 academic year. Feedback from participants indicated that the summer program was relevant to their needs and provided many with the stimulus to attempt to teach ESCP the following year. (BC)

EDO 24606

A SUMMER PROGRAM FOR TEACHERS OF EARTH SCIENCE CURRICULUM PROJECT MATERIALS

By

Robert B. Nicodemus

CCSS Project, The Joint Board on Science Education of the Washington Academy of Sciences and the D.C. Council of Engineering and Architectural Societies.

4th year report. 1967-68

Supported by a grant from the Cooperative College-School Science Program of the National Science Foundation

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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note: the first three year reports have been reproduced by ERIC under number ED 013 216 titled Cooperative College-School Science Project--First, Second, and Third Year Reports.

Description

The Earth and Space Science Program continued, into a fourth year, introduction of local science teachers to new science programs with extensive utilization of community resources. Thirty-eight secondary teachers from seven public school systems attended a five week full-time program conducted at Montgomery Junior College, June 26-July 28, 1967 on the newly available ESCP (Earth and Space Curriculum Project) materials. A grant from the National Science Foundation supported the activities which included a follow-up program of six Saturday meetings during the academic year 1967-68. The summer featured twelve guest lecturers representing local universities, government and private industries. The lecturers were selected on the basis of research interests related to the ESCP curriculum and an expressed interest in communicating with teachers. Each speaker was provided with the section of the ESCP text relating to his talk prior to the meeting. Three college teachers and an experienced ESCP high school teacher conducted most of the one hundred sixty hours of lectures, laboratories and field trips. Three-fourths of this time was in laboratory work divided between work with ESCP materials and related college-level content.

Two staff member attended special conferences on ESCP materials in Boulder Colorado,[1] prior to planning for the summer.

On the basis of teacher evaluation,[2] the summer program was very relevant to their needs especially in providing the opportunity to work with ESCP laboratory materials and discuss its inquiry approach, obtain further content background and hear lectures from specialists. Half of the teachers said they would not have attempted the ESCP program without the summer experience. Most of them were encouraged to try the program during the following year. Criticisms pointed to particular deficiency in the physical science background of many teachers and the need for teacher programs to take this into account. Teachers particularly enjoyed becomming familiar with local resources through field trips that they could conduct with their own classes.[3]

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1. refer to the report by John Kline in this paper
2. in the final part of this report
3. refer to the report by Dr. David Gardner in this paper

Evaluation of the Secondary School Institute for ESCP Laboratory Instructors, May 10-14, 1967, Boulder Colorado by John Kline

The purpose of this conference was to familiarize teachers, who would be conducting ESCP Laboratory Investigations in NSF Institutes, with the new investigations in the new edition of Investigating the Earth. Emphasis on the philosophy and approach of investigations was based on evaluation of the experimental edition by teachers.

Most of the time was in laboratories presented in the same way anticipated in the high school situation. There is absolutely no substitute for the expert meeting the novice face to face in a very personalized situation to insure that the philosophy and subject matter are experienced in context. These experiences could then be passed on to the teachers in the summer. This very important responsibility was emphasized over and over again. How effectively we performed our functions in the comming summer would determine to a large extent future plans for the preparation of earth science teachers. In addition to actually participating in the labs, time was spent in discussing evaluatioh, equipment, odering and suggestions from teachers who had previous experience in past summer institutes.

This experience represents one of the most valuable resources in my own teaching as well as for work with other teachers. I feel much better equipped to provide answers that represent in part the view of ESCP staff and writers. I regret that every earth science teacher cannot have the same experiences. Since this is obviously impractical, the next best thing is to keep the number of steps between expert and novice at a minimum through institutes and cooperative college-school science programs

Notes on two local field trips by Dr. David Gardner

Woodstock Dome

The "Woodstock Dome", near the Patapsco River in Southwestern Baltimore County, occurs today as a concentric pattern of outcroppings of igneous and metamorphic rock. At the center, near the small village appropriately named Granite, Maryland, the rock is granite. Arranged around the granite are successive uptilted beds of gneiss, quartzite, and marble. These metamorphic rocks were tilted and thrust upward by the igneous granite when it was in liquid form. The Baltimore gneiss in this sequence is the oldest rock in Maryland, having been dated at about 1.1 billion years by means of radioactive isotopes. Outcrops of the Cockeysville marble tend to occupy "solution valleys", or depressions caused by the action of ground water in dissolving and washing away the relatively soluble carbonate rock. The Cockeysville marble is of further interest because of its use in the facing of the Washington Monument in the Nation's Capitol.

Piscataway Creek

The banks of Piscataway Creek, near its mouth at the Potomac River, contains a variety of beautifully preserved marine fossils. These were laid down when theis part of Prince Georges County was under a shallow sea, about 55 million years ago. Sharks' teeth are abundant as well as the oddly shaped dental plates of large clam-eating sting rays. Among the invertebrates, are the spiral shells of the Turritella genus, and excellent internal casts of the giant clam Cucullaea gigantea, some as large as grapefruit.

Summary of the

EARTH AND SPACE SCIENCE SUMMER PROGRAM*

Daily Schedule

Four hours of laboratory
One and one-half hours of lecture

Monday, June 26

Registration
Introduction to ESCP** - Dr. Marjorie Gardner
Crystals
ESCP P-1, P-2 - Prologue

Tuesday, June 27

Mineralogy I
ESCP 1 & 2 - Earth Changes and Materials
Crystals - Dr. Peggy Dixon

Wednesday, June 28

Mineralogy - Dr. David Gardner
Mineralogy II
ESCP 3 - Earth Measurement

Thursday, June 29

Mineralogy III
Microscope
Geodesy - Dr. Helmutt Schmid

Friday, June 30

Petrology I
ESCP 4 & 5 - Earth Motion, Force Fields
Petrology - Dr. David Gardner

*supported by a grant from the National Science Foundation to the Joint Board on Science Education

** ESCP (Earth Science Curriculum Project)

underlined titles are lectures

Second Week

Monday, July 3

Petrology II
ESCP 6 & 7 - Motion and Energy
Structural Geology - Dr. David Gardner
Field Trip to Woodstock Dome
Change in Living Things

Wednesday, July 5

Change in Living Things
Petrology II
Soils - Dr. Charles Kellogg
Field Trip to Woodstock Dome
ESCP 6 & 7 - Motions and Energy

Thursday, July 6

Gravity
ESCP 8 & 9 - Water in Air, Land and Sea
Heat Energy - Dr. Peggy Dixon

Friday, July 7

Boyle's and Charles Laws
ESCP 11 - Energy, Moisture and Climate
Meteorology - Dr. Bernard Lettau

Third Week

Monday, July 10

Heat of Fusion, Sublimation
Plants and Animals Modify the Soil
Physics of the Atmosphere - Dr. Peggy Dixon

Tuesday, July 11

Microtopography - Mr. Franklin Sterns
Bathymetry
ESCP 13 & 14 - Sediments, Mountains

Wednesday, July 12

Earth Magnetism
Plants and Animals Modify the Climate
Hydrography - Mr. William Foster Jr.

Thursday, July 13

Hydroscopy
ESCP 15 & 16 - Rocks, Earth Interior
Seismology - Mr. Leonard Murphy

Friday, July 14

Oceans, Lakes & Shoreline Features
Taxonomy of Trees
ESCP 17 - Time and Measurement
Marine Ecology - Mr. Richard Waller

Saturday, July 15

Field Trip to Solomons Island Biological Laboratory

Fourth Week

Monday, July 17

Columbia River and the North East Pacific - Dr. M. Grant Gross
Variation Within the Species
ESCP 18 & 19 - Records in the Rocks

Tuesday, July 18

Vulcanism - Dr. David Gardner
Radioactivity - Mr. Alan Roecklein
ESCP 20 - Development of a Continent
Radioactivity

Wednesday, July 19

Radioactivity
Climax Concept
Evolution - Dr. Robert Frieders
Evaluation - Dr. Robert Fite, National Science Foundation
Climax Concept
ESCP 20 - Development of a Continent
Evening - Naval Observatory

Thursday, July 20

Piscataway Field Trip
Age of the Earth - Dr. David Gardner
ESCP - Evolution of Landscapes
Distribution of Life Forms
Evening - Naval Observatory

Friday, July 21

Paleontology - Dr. K. Norman Sachs
Paleontology
ESCP - Evolution of Landscapes
Distribution of Life Forms
Paleontology
Evening - National Capital Astronomers

Fifth Week

Monday, July 24

Social Life of Animals
ESCP 22 & 23 - Moon and Solar System
Plant and Animal Distribution - Dr. Robert Frieders
Evaluation - Dr. Merrill K. Ridd, Associate Director, ESCP

Tuesday, July 25

Topographic Maps
ESCP 24 & 25 - Stars and Galaxies
Glaciology - Dr. David Gardner

Wednesday, July 26

Optics and Spectroscopy
Glaciers
Astronomy - Dr. Benny Klock

Thursday, July 27

Planetarium
ESCP 26 - Universe and Its Origin
Radioastronomy - Dr. Gart Westerhout

Friday, July 28

Philosophy of ESCP - Mr. John Kline
Evaluation of Program
Staff Summaries
Inquiry in New Science Curriculum and Evaluation - Mr. Robert B. Nicodemus

EARTH SCIENCE CURRICULUM PROJECT
Follow-Up Meetings

Note: All meetings are on Saturday

October 7 9 A.M.- 1 P.M.	- Geology field trip to Bear Island led by Dr. David R. Gardner, Department of Physics, Montgomery Junior College.
November 11 9 A.M.- 4 P.M.	- Field trip - Geology of Washington and Related Problems. Designed to show the relation of the metamorphic and intrusive rocks of the Piedmont to the unconsolidated sediments of the Coastal Plain. In addition, the trip pointed out the importance of geology in planning for the future of the area. Opportunity to collect minerals, wood fragments and such. Joint meeting with the National Association of Geology Teachers.
January 27 9 A.M.- Noon	- Film lecture and laboratory on Vulcanism conducted by Dr. David R. Gardner at Montgomery Junior College. Film - "Volcano Surtsey" - has been widely acclaimed as best on this particular subject.
March 16 9 A.M.- Noon	- Lecture on the Fall Line by Dr. David R. Gardner with field mapping and use of geological maps. Montgomery Junior College.
April 27 9 A.M.- Noon	- Field trip to Great Falls led by Dr. David R. Gardner. A field study of the effects of stream action in a cataract. Observation of differences in rate of stream erosion associated with different kinds of metamorphic and igneous rocks.
May 25 9:30- 11:30	Lecture on Terrestrial Magnetism and some Aspects of the Theory of Continental Drift by Dr. Gardner. New ESCP film "How Solid is Rock"

Cooperative College-School Science Project
Montgomery Junior College
Rockville, Maryland
20850

List of teachers completing the five-week program in Earth and Space Science held at Montgomery Junior College June 26 - July 28, 1967.

State of Virginia

Alexandria City Public Schools

Lanny E. Lehto
Sylvia White

Arlington County Public Schools

Charles H. Silver

Fairfax County Public Schools

Rita E. Kelly
Jack L. Stemple

Private Schools

Barry Sperling

State of Maryland

Frederick County Public Schools

William Cessna
Paul Cook
John A. Fradiska
Francis A. Mullen
John P. Straits

Montgomery County Public Schools

Eleanor Bluestein
Carol S. Chaudoir
Eugene P. Csonka
William D. Duncan
Jane L. Engelberg
Charles L. Geanangel
Nancy Hendler
Diana F. Hereda
Raymond E. Koelsch
Charles Robertson
John W. Rolls
Robert Smith
Jean B. Spragins

(con'd - next page)

Prince George's County Public Schools

Robert F. Beck
Diane Bedford
Roger A. Bolland
Preston L. Kendall
John Kirkpatrick
Walter T. Lea Jr.
Donald L. Smedley
Frederick W. Stutz

Parochial Schools

Irene Mechak
Marguerite St. Clair
David Thate

Private Schools

Irene B. Ansher

District of Columbia

Public Schools

Bernard A. Davis
Otis W. Thompson

SUMMER PROGRAM FACULTY

Staff

Peggy A. Dixon, Associate Professor, Physics and Astronomy, Montgomery Junior College. Ph.D. University of Maryland 1959; M.S. 1954; B.S. Western Reserve University 1950.

Robert B. Frieders, Associate Professor, Biology, Montgomery Junior College. Ph.D. Catholic University 1954; M.S. 1949; B.S. St. Meinrad College 1942.

David R. Gardner, Assistant Professor, Geology and Physical Sciences, Montgomery Junior College. D.P.A. Harvard University 1958; M.P.A. 1952; M.S. Michigan State University 1951; B.S. University of California, Berkeley, 1948.

John Kline, ESCP Teacher, Madison High School, Fairfax County, Virginia. B.A. Bridgewater College 1959; M.Ed. University of Virginia 1964.

Advisors

Dr. Marjorie H. Gardner, Associate Professor of Science Education, University of Maryland, and Director of Teacher Preparation, ESCP.

Dr. J. David Lockard, Associate Professor of Botany and Science Education and Director, Science Teaching Center, University of Maryland; Director, AAAS International Clearing House on New Science and Mathematics Curricula; Director of Science Projects, Joint Board on Science Education.

Dr. John Snyder, Director of Education, American Geological Institute, Washington D.C.

Dr. John F. Thompson, Acting Director of ESCP Teacher Preparation, Earth Science Curriculum Project, Boulder, Colorado.

Dr. Frank Verwiebe, Chairman, Department of Physics, Montgomery Junior College.

Director

Robert B. Nicodemus, Assistant Professor, Biology, Montgomery Junior College; MA.T. in Biology, The Johns Hopkins University 1961; B.A. The George Washington University 1956. Director of CCSS Projects for the past three years.

CONSULTANTS

Mr. William A. Foster Jr., Director, Bathymetry Division, U. S. Naval Oceanographic Office.

Dr. M. Grant Gross, Associate Curator, Division of Sedimentology, U. S. National Museum, Smithsonian Institution.

Dr. Charles E. Kellogg, Deputy Administrator for Soil Survey, U. S. Department of Agriculture.

Dr. Benny L. Klock, Technical Assistant Director, Six-Inch Transit Circle Division, U. S. Naval Observatory.

Dr. Bernhard Lettau, Research Meteorologist, Environmental Science Services Administration.

Mr. Leonard M. Murphy, Chief, Division of Seismology, Coast and Geodetic Survey, Environmental Science Services Administration.

Mr. Alan Roecklein, Director, Radiation Science and Technology Program, Montgomery Junior College.

Dr. K. Norman Sachs, U. S. Geological Survey.

Dr. Helmutt H . Schmid, Director, Geodetic Research Laboratory, Institute for Earth Sciences, Institutes for Environmental Research, ESSA.

Mr. Franklin Sterns, Research Oceanographer, Environmental Oceanographic Research.

Mr. Richard A. Waller, Research Oceanographer, Environmental Oceanographic Research.

Dr. Gart Westerhout, Professor and Director of Astronomy, University of Maryland.

TEACHER EVALUATIONS OF SUMMER PROGRAM
July 1967

1. Comment on what aspects of the summer program you found most relevant:

ESCP	24
Geology	22
Field trips	16
Biology	15
Guest lectures	11
Films	9
Use of ESCP equipment	9
Labs suitable for Jr. High students	6

Some representative answers were:

"The speakers helped to broaden our knowledge and make us more appreciative of the scientists and the work they are doing."

"The films were tremendous and made me very envious; since our school system has very few of these and doesn't have the money to purchase them. I hope my enthusiasm for them will influence administration officials to purchase these teaching aids."

"Field trips were most enjoyable and beneficial. I have at home some rocks which I picked up on a field trip (some fossils also). I'll be able to take them to school -- and this year -- instead of just talking about a particular rock, I'll be able to show one to the kids."

"Probably the most relevant aspect of the program was that part which I shall not come to fully appreciate until much later -- the orientation to the ESCP book. It will have to help me in the classroom. At least, I am dimly aware of the challenge that lies ahead."

"Biology classes instilled an appreciation for the interdependence of earth and life science."

"The field trips opened up a new source of ideas and understanding."

"This has been the most significant educational period that I have ever experienced in terms of professional enrichment."

"I like the investigative approach to ideas and the tie-in to modern living."

"Being a young, new teacher, I gained a great deal from the association with other teachers."

"Most relevant were the lectures given by experts who are engaged in basic studies, who reported the latest findings in their fields of study."

"The most enjoyable aspect of the whole course was the opportunity of meeting the other teachers -- learning about their school systems and of their personal experiences."

"Field trips were fascinating."

"I've obtained a fund of information on local sources for lectures, materials and field trips for use during the coming year."

"Enjoyed the use of equipment not found in most junior high schools."

"I am now aware of the greater vistas beyond introductory general science to which I can lead my students."

"I was able to acquire lab techniques that will definitely enhance the teaching of the regular eighth grade course which is predominately earth science and also the seventh grade which is mainly biology."

"The ESCP instructor had experienced the teaching of this course and was able to give us the benefit of problems which arose from his experiences and how they could be handled."

"Most relevant was the laboratory method of presenting concepts."

"The idea of exposing science teachers to recent findings in varied fields of science holds great potential. I would like to see this type forum continued during the school year -- for credit."

2. What changes would you recommend to make the summer program better?

Reorganize or omit physics	26
Coordinate guest lectures with text and labs (some speakers were too elementary; others were way over people's heads)	15
Less emphasis on biology (or perhaps none for those with strong backgrounds in subject)	13
Include more geology and field trips.	7
Have more ESCP	4
Divide laboratory groups according to ability and allow more flexibility in schedule	4

Specific criticisms were:

"I loathed and detested the showing of excellent films during lunch hour."

"I would suggest evaluation testing at the end of third and fifth weeks."

"Some of the lectures, speakers and labs should have been better coordinated."

"Less material in physical sciences with more emphasis on pre labs and post labs would have allowed me to gain more."

"Allow more interchange between groups. For example, if one is well versed in one laboratory experiment during a given day and not in another, allow the individual to spend both lab periods in the unfamiliar area."

"ESCP will appeal, appetize and challenge above-average to superior students. Could they adapt a program for disadvantaged students?"

"Some lectures were far above our level. Speakers should have been asked to provide material that we could use in class."

"Wish I could receive college credit for the course."

"The physics program was completely over my head. The inspiration I had coming into the program was completely stepped on and after three days, I gave up. Maybe this is bad for a teacher, but it happened."

"Because of my lack of scientific background, I would recommend more homogenous grouping. Very little was new to some of my colleagues; too much was new to me."

"It might have been better to skip some labs and procedures in order to cover others in more detail. Many were not carried to completion due to lack of time."

"Nothing was ever said which would indicate how the average youth might put some of this information to use in his every day living, in his job or in his recreation. If the subject is oriented to 'What can I use this information for?', much better student interest and participation will result."

"Obviously individual backgrounds and competencies vary widely; but a brief introduction and explanation of the basic fundamentals would not insult those familiar with the subject and would be very helpful to those unfamiliar with the material."

"I'm sorry we didn't have more field trips."

"Too much previous knowledge was assumed in physics; too little assumed in biology."

"Include a brief course in mathematics (relevant to text); math as presented was meaningless."

"Brochure on program did not fully explain it; wasn't quite what expected."

3. A. Has this program encouraged your adoption of the ESCP materials?

Yes	28
No	2
With reservations	2

B. Would you have attempted ESCP without the summer experience?

No	15
Yes	8
With reservations	4
Perhaps	1

Specific comments regarding the above questions were:

"This summer workshop will cut the time in preparing an effective program in half."

"I'm very enthusiastic about ESCP and am looking forward to teaching it."

"Got a good overview of the entire course to be taught."

"Doubtful that I would have attempted to teach the program without the workshop."

"I would not have attempted ESCP without the summer program because I would not have known what equipment to have ordered and in what amounts."

"Yes, I would have attempted ESCP, going into it blindly. I have learned much that will facilitate greatly my teaching of the ESCP program."

"I would have attempted the program without the summer experience, but with a definite feeling of being inadequate and knowing little more than my students."

"A 'yes' to B, because I like to accept challenges."

"I feel I will be a better teacher having been a participant."

"This course has made me want to teach E.S.C.P. and I know I can do a good job because of this program."

"I would not have known ESCP existed without this program."

"This program has definitely encouraged me to use ESCP materials and the ESCP philosophy in all classes."

"The teacher's guide sounds like an answer to a teacher's prayer."

"I certainly approach this fall with great amounts of trembling, but it is informed fear, which is much better than fear of the unknown."

"I taught earth and space science last year; however, the experience gained in this summer program would have greatly eased my instructional problems and would have added greatly to student interest."